

A STUDY OF THE GENUS *CHROTOGONUS* AUDINET-SERVILLE, 1839 (ORTHOPTERA: ACRIDOIDEA). IV.

WING POLYMORPHISM, TECHNICAL DESIGNATIONS AND PRELIMINARY SYNONYMY

by

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Many orders of insects show a considerable degree of alar polymorphism, and among them are included the Orthoptera.

The possession, by the same species, of wings of differing sizes in different individuals has often led to the description of invalid species, especially amongst insects of which comparatively little material was available at the time of the original descriptions. The Pyrgomorphid Acridoid genus *Chrotogonus* has suffered particularly in this respect and, pending the publication of a comprehensive revision of the genus, it is considered desirable to clarify the position as much as possible in advance by indicating the synonymy which has now been established (KEVAN, 1956). This at least will permit references of a general nature to be made in future without going into elaborate details of synonymy on the one hand, or using incorrect nomenclature, on the other.

A large number of so-called species of *Chrotogonus* have been based mainly upon variable tegminal and wing characters, with the result that many now prove to be synonymous and their names may be used only for infra-subspecific taxa, and then only where these are sufficiently distinctive to merit their continued recognition. Although many of the different paramorphs of *Chrotogonus* species thus have what might be regarded as infra-subspecific names, there is no uniformity in the matter. There are also many distinctive forms, in one species or another, which remain without names of any sort, as reference to the accompanying Table will show.

BOLÍVAR (1904) actually recognized certain infra-subspecific categories in some *Chrotogonus* species, but there is some doubt as to whether the names by him all conform to the conditions governing the use of infra-subspecific names laid down in the revised Rules of Zoological Nomenclature, since it is not made clear beyond doubt by the author that his "forms" are to be regarded as having other than subspecific status (*Bull. zool. Nomencl.*, 1950, vol. 4, p. 89—96; HEMMING, 1953, p. 84, par. 165). However, since BOLÍVAR did state that no specific (rather than subspecific) differences exist between his ff. "*macroptera*" and "*braquiptera*" (usually written by him with the valid spelling "*brachiptera*"), we may presumably accept his names as infra-subspecific. Nevertheless the pedant could argue that the formally described "forms", "*Chr. Abyssinicus* f. *brachiptera*", "*Chr. La-meerei* f. *brachiptera*" and "*Chr. Senegalensis* f. *macroptera*", should strictly be regarded as being of subspecific rank and that the two former names are objective junior homonyms of *Chrotogonus brachipterus* Bolívar, 1902 [itself a synonym

of *Ch. oxypterus* (Blanchard, 1836), see KEVAN, 1953]. BOLÍVAR's "*Chr. Senegalensis* f. *brachyptera*" and "*Chr. Savignyi* f. *macroptera*", however, are strictly infra-subspecific, since they refer to typical forms of their respective nominal species. As will be discussed elsewhere, "f. *brachyptera*" of what BOLÍVAR calls "*Chr. Savignyi*" is an invalid usage.

Whether or not there is any merit in recognizing formal infra-subspecific names for different variational forms of strongly polymorphic species, such as those of *Chrotogonus*, it cannot be denied that some sort of terminology is at times useful, but it would be most undesirable to raise a plethora of new names (all of which would presumably have to differ) for the numerous variants for which no infra-subspecific names at present exist, or even to perpetuate existing specific and sub-specific synonyms (and homonyms) by regularizing their use at an infra-sub-specific level. At present, the old names may be used as indicated in the Table, but it is here proposed that a series of uniform 'technical designations' for similar forms throughout the whole genus should be adopted in accordance with the provisions made by the Thirteenth International Congress of Zoology, and approved at Paris in 1948 (*Bull. zool. Nomencl.*, 1950, vol. 4, p. 96, Conclusion 1, Recommendation 15; see also HEMMING, 1950, p. 214).

As with existing names, however, considerable difficulty has arisen in finding an objective means of deciding how many such technical designations should be recognized, because few of the numerous arbitrary categories into which it is possible to divide the forms of *Chrotogonus* species are discrete, there being numerous intermediate conditions. After careful consideration it has been decided to adopt four such technical designations only, referring to the most clearly distinguishable forms.

In defining technical designations based upon alar development, consideration should first be given to the numerous arbitrary categories which have previously been used in the study of wing polymorphism and which are sometimes useful for descriptive purposes. Some species of *Chrotogonus* are represented in several, often many, of these categories, but none is known in which all conditions of alar development are found.

The most recent account of wing terminology is that of LA GRECA (1954) who draws freely from RAMME (1951) and refers to the works of PUSCHNIG (1914), POISSON (1924) and LARSÉN (1931). By employing a combination of the categories used by these authors it is possible to use already existing terms for the majority of the different degrees of wing development in the Acridoidea; only very few supplementary terms are added here for the sake of completeness.

Many of the terms used were previously based on a comparison of the length of the wings with that of the abdomen and this is broadly adhered to, but, as RAMME (l.c.) has also pointed out, the comparison is not altogether satisfactory since the length of the abdomen may vary considerably (especially in females). The distance along the hind femora reached by the fore pair of wings when at rest is also a useful measurement, except in long-legged forms which are not considered here, but a more satisfactory and convenient quantitative means of expressing differences in wing-length in Acridoidea is provided by the ratio, length of tegmen (or elytron) over length of hind femur (the E/F ratio of acridological literature) — cf. fig. 1.

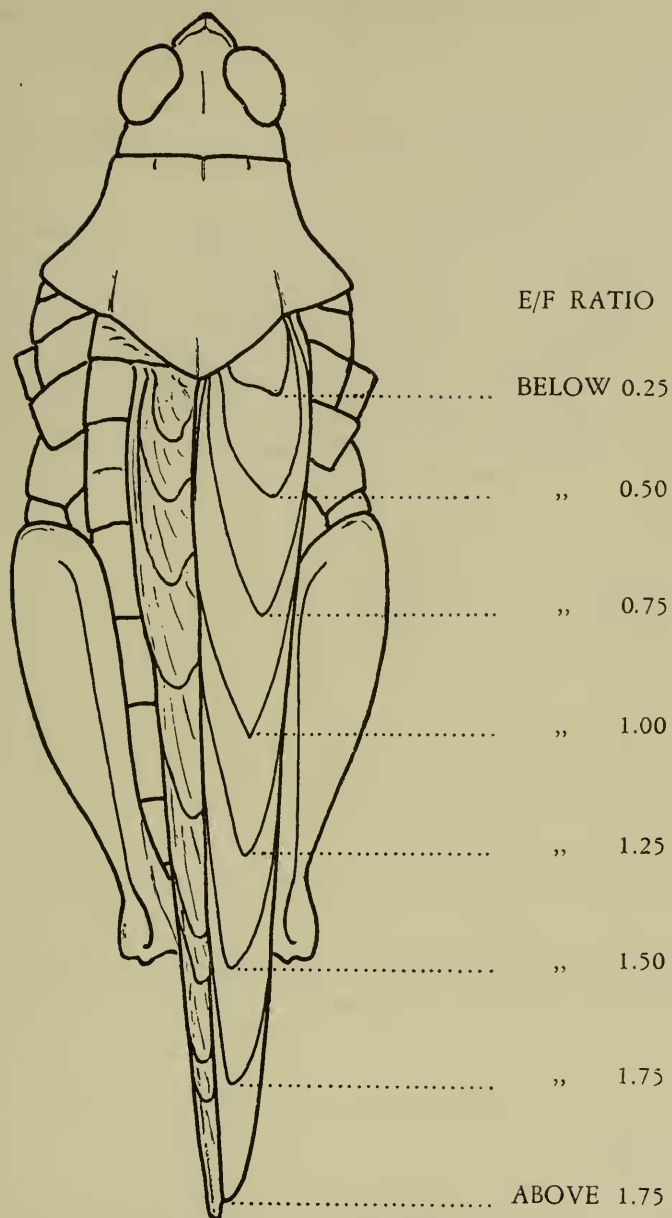


Fig. 1. Schematic diagram of *Chrotogonus* sp. (with left tegmen removed) to indicate varying degrees of alar development. For technical designations based on these, see text; E/F = tegmen (elytron)/hind femur lengths.

Five major groups of categories of wing development have been recognized, although only the first and the third of these are strictly applicable to *Chrotogonus*¹). They are as follows:

A) *Eupterous group* (of RAMME = macropterous, sensu lato, part) — Insects capable of flight; fore and hind wings well developed, the latter in length approximately equalling the former when at rest and reaching or extending beyond the apex of the abdomen and the hind knees.

B) *Parapterous group* (RAMME, LA GRECA = macropterous, sensu lato, part) — Insects usually capable of flight; hind wings well developed and considerably longer than the fore pair. Among Acridoidea found principally in Tetrigidae; also occurs in Ensifera. Various unnamed categories within this group exist, but it is not relevant to discuss them here; the prefix "para-" could conveniently be added to other terms to denote that the fore wings are shorter than the hind.

C) *Hypopterous group* (PUSCHNIG, sensu RAMME, LA GRECA) — Insects incapable of proper flight due to reduction in length of the hind wings and usually of the fore pair also; at least vestiges of the latter always, and of the former usually, present.

D) *Stenopterous group* (LA GRECA) — Both pairs of wings greatly narrowed without proportional reduction in length; some degree of hypopterism usually also occurs. The condition is quite abnormal in *Chrotogonus*. Various unnamed categories within this group exist, but it is not relevant to discuss them here; the prefix "steno-" could conveniently be added to other terms to denote narrowing of the wings.

E) *Apterous group* (sensu stricto) — A single category in which no vestige of wings remains. Certain near-apterous forms are known where the front wings are concealed by the hind margin of the pronotum (not in *Chrotogonus*), but these, considered strictly, are hypopterous.

It should perhaps be noted that PUSCHNIG's term "hypopterous", as originally proposed, also included apterous forms, but its usage has been restricted as above by RAMME and LA GRECA (ll.cc.); the latter author proposes the term "meiopterous" for all forms are not eupterous. The term "macropterous" is often loosely used, particularly for parapterous forms, but its meaning has now been restricted (see also hereafter); "brachypterous" has similarly been widely used for hypopterous forms in general, but the use of this term has also been limited (see below).

The two main groups which contain forms of *Chrotogonus* may now be subdivided: the *Eupterous* group contains two sub-groups, macropterous and mesopterous, as follows: —

1. MACROPTEROUS (sensu stricto — or if an unambiguous term is required, EUMACROPTEROUS) — Fully alate, the hind wings *at rest* reaching or (as in *Chrotogonus*) projecting very slightly (sometimes only just perceptibly) beyond the apices of the tegmina. There are three arbitrary categories within this sub-group:

a) *Hyperpterous* (RAMME) or as preferred herein, *hypermacropterous* — Teg-

¹) The subgenus *Shoacris* Kevan, 1952 is excluded; it is here raised to full generic status on account of its completely apterous condition, rounded, almost vertical frontal profile, its long, slender ovipositor valves, and its peculiar type of sculpturation.

mina and wings extending a long way beyond the apex of the abdomen and the hind knees, imparting a long narrow appearance to the insect. [E/F ratio in *Chrotogonus* 1.75—2.0 or more.]

b) *Holopterous* (RAMME) — or as preferred herein, *holomacropterous* — Tegmina and wings extending appreciably, but not excessively beyond the apex of the abdomen and the hind knees. [E/F ratio in *Chrotogonus* over 1.5 but under 1.75.]

c) *Hypomacropterous* (LARSÉN) — This term was originally used for Hemiptera; here it is taken as referring to Acridoidea in which the tegmina and wings scarcely (or even do not at all) surpass the apex of the abdomen and the hind knees, giving them a rather squat appearance compared with the above. [E/F ratio in *Chrotogonus* not more than 1.5; very similar to some mesopterous individuals (see below), but differing in that the hind wings slightly exceed the tegmina at rest, even if only to a very small degree.] It is possible that RAMME's term 'mesopterous' refers to this form, but see below.

All the above categories in *Chrotogonus* may be grouped under the single technical designation, f. *macropterous*.

2. *MESOPTEROUS* (PUSCHNIG) — Tegmina almost reaching, or even surpassing the apex of the abdomen and the hind knees; hind wings large, reaching nearly, but not quite to the apex of the tegmina when *at rest*. [In *Chrotogonus*, if the wings are at right-angles to the body, the hind pair may fall considerably short of the apices of the tegmina, but in the resting position the shortfall is never as much as 20 per cent in this form; E/F ratio usually a little over 1.5.]

PUSCHNIG includes this category among the hypopterous group; RAMME places it with his eupterous forms. PUSCHNIG says the tegmina do not quite reach the end of the abdomen and that the ability to use the wings is retained; RAMME (followed by LA GRECA), on the other hand, includes forms in which the tegmina extend slightly beyond the apex of the abdomen and hind knee. These differences between original and subsequent definitions are disposed of by the present interpretation which further permits subdivision into "hyper-", "holo-" and "hypo-" categories, as in the eumacropterous sub-group. In *Chrotogonus* the first condition is unknown and nothing is to be gained by differentiating between the other two. All mesopterous forms in this genus may be given the technical designation, f. *mesopterous*.

The *Hypopterous* group of categories contains three previously recognized sub-groups: brachypterous, micropterous and subapterous, as follows: —

1. *BRACHYPTEROUS* (sensu stricto, PUSCHNIG, RAMME, LA GRECA) — With tegmina and hind wings, or at least the latter, reduced, the former at least being of appreciable size; tegmina reaching at least as far as the middle of the hind femora and normally contiguous or overlapping dorsally for the greater part of their length and covering at least half of the abdomen. [E/F ratio in *Chrotogonus* at least 0.75; hind wings at rest falling short of the apices of the tegmina by at least 20 per cent. *Ch. brachypterus* I. Bol., 1902 does not belong here.]

Since the tegmina and hind wings do not necessarily march in step in their respective degrees of reduction, there is theoretically a very large number of intergrading categories into which this sub-group may be divided (see fig. 1). So far as *Chrotogonus* at least is concerned, it is convenient as an aid to identification

to make an arbitrary distinction between those forms in which the hind wings are comparatively well developed in relation to the tegmina (viz., over two-thirds as long when at rest) and those in which the hind wings are considerably more reduced than the tegmina (less than two-thirds). The terms *isobrachypterous* and *heterobrachypterous* may be assigned to these two divisions respectively. The prefixes "iso-" and "hetero-" could, if desired, be interpolated into the terms suggested for the four purely arbitrary categories of tegmen length suggested below to indicate hind-wing size also. The general usefulness of such terminology may be small, but it is convenient to have available single terms which may serve in contexts where the use of numerical indices or descriptive phrases would be cumbersome. The four arbitrary categories are:

a) *Megabrachypterous* — Tegmina more or less fully developed, exceeding the hind knees at rest, but hind wings reduced in accordance with the term "brachypterous". [E/F ratio in *Chrotogonus* over 1.5; isobrachypterous condition not recognized.]

b) *Sub-brachypterous* (POISSON) — This term was originally used for Hemiptera; here it is used for brachypterous forms in which the tegmina are reduced, but (except in distended females) cover all but the extreme apex of the abdomen, and reach to the hind knee-lobes. [E/F ratio in *Chrotogonus* 1.25—1.5; both isobrachypterous and heterobrachypterous conditions occur.]

c) *Eubrachypterous* — Tegmina leaving the apex of the abdomen clearly exposed and reaching about as far as the narrowest parts of the hind femora, but not extending as far as the hind knees. [E/F ratio in *Chrotogonus* between 1.0 and 1.25 (i.e. tegmina and femora of about equal length); both isobrachypterous and heterobrachypterous conditions occur.]

d) *Hemibrachypterous* — Tegmina leaving several abdominal segments exposed and reaching only as far as the middle of the hind femora (or only slightly beyond this). [E/F ratio in *Chrotogonus* 0.75—1.0; with this degree of reduction, it is not practicable to recognize an isobrachypterous condition.]

All of the four above categories in *Chrotogonus* may be grouped under the single technical designation, f. *brachypterus*.

2. MICROPTEROUS (PUSCHNIG and LA GRECA) — Tegmina and hind wings greatly reduced, leaving at least half of the abdomen exposed; tegmina commonly with reduced and modified venation, often lateral in position, not meeting in the mid-dorsal line (or if so, then for less than half their length), not reaching the middle of the hind femora; hind wings present even if represented only by minute scales, occasionally, where the tegmina are extremely abbreviate (as often in *Chrotogonus*), projecting slightly beyond the apices of the latter. [E/F ratio in *Chrotogonus* less than 0.75.]

RAMME uses "micropterous" in a more restricted sense, applying the term only to forms in which the tegmina meet dorsally; the remainder he call "squamipterous" (but see below). Three intergrading arbitrary categories may be recognized for convenience in this sub-group:

a) *Sub-micropterous* (POISSON) — This term was originally used for Hemiptera; here it refers to forms in which the tegmina may cover up to almost half of the abdomen, frequently meeting dorsally for a short distance only (micropterous, sensu RAMME), surpassing the bases of the hind femora, but falling short (often

far short) of their middles. [E/F ratio in *Chrotogonus* between 0.5 and 0.75; tegmina reaching at least to the hind margin of the second abdominal tergum.]

b) *Squamipterous* (RAMME) — When proposed, this term included also the next category and the next sub-group; here it is restricted to include those forms in which the tegmina are abbreviated to small flaps which leave almost all the abdomen exposed, but which extend beyond the posterior margin of the metanotum. [In *Chrotogonus* not usually extending as far as the second abdominal tergum and falling short of the bases of the hind femora or just reaching them, E/F ratio 0.25—0.5; in this genus the first abdominal tergum is often crossed dorsally by a distinct furrow which may suggest two segments where there is but one.]

c) *Eumicropterus* — Tegmina and wings extremely abbreviate and scale-like; not, or scarcely extending beyond the hind margin of the metanotum and falling far short of the bases of the hind femora. [E/F ratio in *Chrotogonus* less than 0.25; owing to the great reduction of the tegmina, the hind wing-scales cannot do otherwise, in most cases, than project slightly beyond them.]

All of the above three categories in *Chrotogonus* may be grouped under a single technical designation, f. *micropterus*.

3. SUBAPTEROUS (LA GRECA) — A single category in which the tegmina are vestigial, scale-like, or form minute folds in the integument, without venation visible to the naked eye; all traces of hind wings absent.

This category has not been found in *Chrotogonus*. UVAROV (1953), in discussing certain specimens of "*Ch. rendalli*" (i.e., *Ch. hemipterus*), states that these have no hind wings, but an examination of the same material shows this to be incorrect; wing-scales are present although very closely applied to the surface of the metanotum.

RÉSUMÉ

Among a large number of categories of wing-polymorphism which have been recognized in the Orthoptera, and most of which have been defined or redefined above, a large proportion are found in *Chrotogonus* species. Of these, four sub-groups are considered to merit the status of "technical designation" for uniform usage throughout the whole genus; several of the other terms may be convenient for descriptive purposes. The technical designations are as follows: —

f. *macropterus* — in which both pairs of wings are fully developed, the hind pair just exceeding the tegmina at rest by a very small amount;

f. *mesopterus* — in which both pairs of wings are well developed, the hind pair not quite reaching the apices of the tegmina at rest, the shortfall being less than 20 per cent. of the length and often very little indeed;

f. *brachypterus* — in which at least the hind wings, and usually the tegmina also, are reduced, but in which the tegmina at rest reach at least to the middle of the hind femora and cover at least half the abdomen, normally meeting dorsally for the greater part of their length; hind wings at most about three-quarters as long as the tegmina; E/F ratio at least 0.75;

f. *micropterus* — in which the tegmina and hind wings are greatly reduced and in which the tegmina do not extend beyond the middle of the hind femora

ALAR POLYMORPHISM IN *CHROTOGONUS*, SHOWING

Valid Species and/or Subspecies	Group	EUPTEROUS			
	Technical Designation	f. macropterus			f. meso- pterus
	E/F Ratios ^{b)}	1.75 or more (hyper- macropt.)	Between 1.5 & 1.75 (holo- macropt.)	1.5 or less (hypo- macropt.)	Usually just over 1.5 (mesopt.)
	Remarks				
<i>oxypterus</i> (Blanch.)	<i>Cb. oxypterus</i> ♂ syntype has E/F = 0.74	 (1.9) not uncommon	<i>fuscenscens</i> Kby. (1.6) common	 (1.3) rare	—
<i>hemipterus</i> Schaum	<i>Cb. rotundatus</i> ♂ syntype has E/F = 2.1. <i>Cb. hemipterus</i> ♀ syntype has E/F = 0.4. In <i>Cb. distant</i> ♀ lectotype the tegmina are unequal. The types of <i>Cb. varelai</i> are lost and E/F is cal- culated from description only; ♀ syntype was apparently submicropte- rus (E/F = 0.7).	<i>rotundatus</i> Kby (1.9) not uncommon	<i>fumosus</i> Bol. (1.7) common	<i>meridionalis</i> Sauss. (1.4) not common	 (1.6) rare
<i>senegalensis</i> <i>abyssinicus</i> Bol.	<i>Cb. abyssinicus</i> f. <i>brachypte- rus</i> lectotype has E/F = 0.77; syntypes have E/F 0.8—0.9. <i>Cb. ituriensis</i> lectotype is ♀; E/F for ♂ syntype = 1.1.	 (1.8) infrequent	<i>abyssinicus</i> Bol. (1.7) not uncommon	? none known may occur	 (1.7) very rare
<i>senegalensis</i> <i>gabonicus</i> Bol.	Few specimens available; full extent of variation unknown.	 (1.8) 	 (1.6) 	? none known may occur	—

^{a.)} The names used in the body of the table are in almost every case assigned to their positions by considering only holotypes or lectotypes. These and other critical specimens will be discussed at a later date. Frequency of occurrence refers to that in the large amount of material examined as a whole; in the field, generally uncommon forms may be locally or seasonally common. Upper rows of dots indicate an unnamed form; lower

RELATIONSHIPS BETWEEN NAMED FORMS ^{a)}

HYOPTEROUS

f. brachypterus ^{c)}				f. micropterus		
Over 1.5 (mega-brachypt.)	1.25—1.5 (sub-brachypt.)	Between 1.0 and 1.25 (eu-brachypt.)	0.75—1.0 (hemi-brachypt.)	Between 0.5 and 0.75 (sub-micropt.)	0.25—0.5 (squamipt.)	Under 0.25 (eumicropt.)
—	 (1.3) rare	<i>liaspis</i> (Blanch.) (1.2) not uncommon	<i>oxypterus</i> (Blanch.) (0.9) <i>saussurei</i> Bol. (1.0—) usual form	 (0.7) not uncommon	 (0.4) ? very local	<i>brachypterus</i> Bol. (0.2) ? very local
—	—	 (1.2) very rare	<i>marshalli</i> Bol. (0.9) infrequent	<i>bloyeti</i> Bol. (0.7) not uncommon	<i>hemipterus</i> Schaum (E/F = ? ; hind legs lacking) <i>distanti</i> Kby. (0.2—0.3) <i>rendalli</i> Kby. (0.4) <i>carinatus</i> Kby. (0.5) <i>rarelai</i> Bol. (0.4) usual form	<i>micropterus</i> Bol. (0.1) <i>hemipterus</i> <i>intermedius</i> Griff. (0.2) local
—	<i>ituriensis</i> Sjöst. (1.3) usual form	 (1.1) common	<i>abyssinicus</i> f. <i>brachypt-</i> <i>erus</i> Bol. (0.8) uncommon	—	—	—
—	—	? none known may occur	<i>gabonicus</i> Bol. (0.9) ? usual form	 (0.7) 	—	—

rows of dots indicate frequency of occurrence unknown. New species and subspecies to be described shortly are included here for completeness.

b) Numbers in parenthesis throughout the table indicate the approximate E/F ratios of holotypes and lectotypes, or of specimens chosen to represent the categories concerned; for details of these, see later parts of this series.

c) Heterobrachypterus except in *Ch. trachypterus*, where isobrachypterus (see p. 48).



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Valid Species and/or Subspecies	EUPTEROUS				
	Group	f. macropterus			f. mesopterus
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	E/F Ratios ^{b)} Remarks				
<i>oxypterus</i> (Blanch.)	<i>Cb. oxypterus</i> ♂ syntype has E/F = 0.74	 (1.9)	<i>fuscenscens</i> Kby. (1.6)	 (1.3)	 —
		not uncommon	common	rare	
<i>hemipterus</i> Schaum	<i>Cb. rotundatus</i> ♂ syntype has E/F = 2.1. <i>Cb. hemipterus</i> ♀ syntype has E/F = 0.4. In <i>Cb. distantis</i> ♀ lectotype the tegmina are unequal. The types of <i>Cb. varelai</i> are lost and E/F is calculated from description only; ♀ syntype was apparently submicropterus (E/F = 0.7).	<i>rotundatus</i> Kby (1.9)	<i>fumosus</i> Bol. (1.7)	<i>meridionalis</i> Sauss. (1.4)	 (1.6)
		not uncommon	common	not common	rare
<i>senegalensis abyssinicus</i> Bol.	<i>Cb. abyssinicus</i> f. <i>brachypterus</i> lectotype has E/F = 0.77; syntypes have E/F 0.8—0.9. <i>Cb. ituriensis</i> lectotype is ?; E/F for ♂ syntype = 1.1.	 (1.8)	<i>abyssinicus</i> Bol. (1.7)	? none known may occur	 (1.7)
		infrequent	not uncommon		very rare
<i>senegalensis gabonicus</i> Bol.	Few specimens available; full extent of variation unknown.	 (1.8)	 (1.6)	? none known may occur	 —

^{a)} The names used in the body of the table are in almost every case assigned to their positions by considering only holotypes or lectotypes. These and other critical specimens will be discussed at a later date. Frequency of occurrence refers to that in the large amount of material examined as a whole; in the field, generally uncommon forms may be locally or seasonally common. Upper rows of dots indicate an unnamed form; lower

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..... (1.3)	 (1.3)	<i>liaspis</i> (Blanch.) (1.2)	<i>oxypterus</i> (Blanch.) (0.9)	 (0.7)	 (0.4)	<i>brachypterus</i> Bol. (0.2)			
..... rare	 rare	not uncommon	<i>saussurei</i> Bol. (1.0—) usual form	not uncommon	? very local	? very local			
..... —	 —	 (1.2)	<i>marshalli</i> Bol. (0.9)	<i>bloyeti</i> Bol. (0.7)	<i>hemipterus</i> Schaum (E/F = ?; hind legs lacking)	<i>micropterus</i> Bol. (0.1)			
..... —	 —	very rare	infrequent	not uncommon	<i>distantis</i> Kby. (0.2—0.3)	<i>hemipterus intermedius</i> Griff. (0.2)			
..... —	 —	 (1.1)	<i>abyssinicus</i> f. <i>brachypterus</i> Bol. (0.8)	 —	<i>rendalli</i> Kby. (0.4)	<i>carinatus</i> Kby. (0.5)			
..... usual form	 common	 uncommon	 —	 —	<i>varelai</i> Bol. (0.4)	usual form			
..... —	 —	? none known may occur	<i>gabonicus</i> Bol. (0.9)	 (0.7)	 —	 —			
..... —	 —	 —	? usual form	 —	 —	 —			

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^{b)} Numbers in parenthesis throughout the table indicate the approximate E/F ratios of holotypes and lectotypes, or of specimens chosen to represent the categories concerned; for details of these, see later parts of this series.

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<i>senegalensis</i> <i>senegalensis</i> Krauss.		<i>senegalensis</i> f. macro- pterus Bol. (1.8) not uncommon	<i>lameerei</i> Bol. (1.7) common	 (1.5) rare	——
<i>senegalensis</i> nov. subsp. (a) (S. & S. E. Sudan)	Not much material avail- able; full extent of va- riation unknown.	 (1.9) ? not rare	 (1.7) probably common	? none known may occur	——
<i>senegalensis</i> subsp. nov. (b) (W. Su- dan to Sene- gal)		? none known may occur	 (1.6) ? not common	 (1.4) not uncommon	——
<i>homalodemus</i> <i>homalodemus</i> (Blanch.)	No actual type specimens of <i>Ch. savignyi</i> or <i>Ch.</i> <i>latus</i> ; E/F ratios calcul- ated from Savigny's (?1825) figures upon which they are based: for <i>Ch. savignyi</i> , the original figure 23 is selected [in his fig 22, E/F = 1.65]. The type of <i>Ch. scudderi</i> is lost and E/F is calculated from description. Bolí- var's (1904) measure- ments for <i>Ch. homalo-</i> <i>demus</i> type give E/F = 1.36.	<i>savignyi</i> (Blanch.) [<i>savignyi</i> f. macro- pterus Bol.] (1.8) ♂ common, ♀ not un- common	<i>scudderi</i> Bol. (1.7) ♂ & ♀ common	 (1.4) ♂ usual form, ♀ rare	 (1.4) ♂ not common, ♀ unknown
<i>homalodemus</i> subsp. nov. (Somalilands etc.)		 (1.8) ♂ uncom- mon, ♀ unknown	 (1.7) ♂ & ♀ common	 (1.4) ♂ usual form, ♀ unknown	 (1.5) ♂ rare, ♀ unknown

a, b, c) See footnotes on p. 50 and 51.

RELATIONSHIPS BETWEEN NAMED FORMS a)

HYOPTEROUS

f. brachypterus c)				f. micropterus		
Over 1.5 (mega- brachypt.)	1.25—1.5 (sub- brachypt.)	Between 1.0 and 1.25 (eu- brachypt.)	0.75—1.0 (hemi- brachypt.)	Between 0.5 and 0.75 (sub- micropt.)	0.25—0.5 (squamipt.)	Under 0.25 (eumicropt.)
—	—	<i>lameerei</i> f. <i>brachy-</i> <i>pterus</i> Bol. (1.0+) not common	<i>senegalensis</i> Kr. [f. <i>brachy-</i> <i>pterus</i> Bol.] (0.8) usual form	<i>occidentalis</i> Bol. (0.7) <i>rolini</i> Bol. (0.6) uncommon	—	—
—	(1.3) ? uncommon	(1.1) ? usual form	(0.9) ? common	? none known may occur	—	—
—	—	—	(0.9) not uncommon	(0.6) usual form	(0.3) not common	—
(1.6) ♂ very rare, ♀ rare	<i>homalodemus</i> (Blanch.) (E/F = ?; hind legs lacking) <i>latus</i> (Blanch.) [= <i>savignyi</i> f. <i>brachy-</i> <i>pterus</i> Bol.] (1.3) <i>aethiopicus</i> Bol. (1.3) ♂ very com- mon, ♀ usual form	<i>lugubris</i> (Blanch.) (1.2) <i>concaus</i> Kirby (1.2) ♂ uncommon, ♀ very com- mon	(0.9) ♂ rare, ♀ not uncommon	(0.6) ♂ unknown, ♀ rare	—	—
? none known may occur	(1.4) ♂ unknown, ♀ usual form	—	—	—	—	—



ALAR POLYMORPHISM IN *CHROTOGONUS*, SHOWING

Valid Species and/or Subspecies	Group Technical Designation E/F Ratios b) Remarks	EUPTEROUS			
		f. macropterus			f. mesopterus
		1.75 or more (hypermacropt.)	Between 1.5 & 1.75 (holo-macropt.)	1.5 or less (hypomacropt.)	Usually just over 1.5 (mesopt.)
<i>senegalensis</i> <i>senegalensis</i> Krauss.		<i>senegalensis</i> f. <i>macropterus</i> Bol. (1.8) not uncommon	<i>lameerei</i> Bol. (1.7) common	 (1.5) rare	—
<i>senegalensis</i> nov. subsp. (a) (S. & S. E. Sudan)	Not much material available; full extent of variation unknown.	 (1.9) ? not rare	 (1.7) probably common	? none known may occur	—
<i>senegalensis</i> subsp. nov. (b) (W. Sudan to Senegal)		? none known may occur	 (1.6) ? not common	 (1.4) not uncommon	—
<i>homalodemus</i> <i>homalodemus</i> (Blanch.)	No actual type specimens of <i>Ch. savignyi</i> or <i>Ch. latus</i> ; E/F ratios calculated from Savigny's (?1825) figures upon which they are based: for <i>Ch. savignyi</i> , the original figure 2a is selected [in his fig 2a, E/F = 1.65]. The type of <i>Ch. scudderii</i> is lost and E/F is calculated from description. Bolívar's (1904) measurements for <i>Ch. homalodemus</i> type give E/F = 1.36.	<i>savignyi</i> (Blanch.) [<i>savignyi</i> f. <i>macropterus</i> Bol.] (1.8) ♂ common, ♀ not uncommon	<i>scudderii</i> Bol. (1.7) ♂ & ♀ common	 (1.4) ♂ usual form, ♀ rare	 (1.4) ♂ not common, ♀ unknown
<i>homalodemus</i> subsp. nov. (Somalilands etc.)		 (1.8) ♂ uncommon, ♀ unknown	 (1.7) ♂ & ♀ common	 (1.4) ♂ usual form, ♀ unknown	 (1.5) ♂ rare, ♀ unknown

RELATIONSHIPS BETWEEN NAMED FORMS a)

HYPOPTEROUS						
f. brachypterus c)				f. micropterus		
Over 1.5 (megabrachypt.)	1.25—1.5 (subbrachypt.)	Between 1.0 and 1.25 (eubrachypt.)	0.75—1.0 (hemibrachypt.)	Between 0.5 and 0.75 (submicropt.)	0.25—0.5 (squamipt.)	Under 0.25 (eumicropt.)
—	—	<i>lameerei</i> f. <i>brachypterus</i> Bol. (1.0+) not common	<i>senegalensis</i> Kr. [<i>f. brachypterus</i> Bol.] (0.8) usual form	<i>occidentalis</i> Bol. (0.7) <i>rolini</i> Bol. (0.6) uncommon	—	—
—	 (1.3) ? uncommon	 (1.1) ? usual form	 (0.9) ? common	? none known may occur	—	—
—	—	—	 (0.9) not uncommon	 (0.6) usual form	 (0.3) not common	—
..... (1.6)	<i>homalodemus</i> (Blanch.) (E/F = ?; hind legs lacking) <i>latus</i> (Blanch.) [= <i>savignyi</i> f. <i>brachypterus</i> Bol.] (1.3) <i>aethiopicus</i> Bol. (1.3) ♂ very rare, ♀ rare	<i>lugubris</i> (Blanch.) (1.2) <i>concavus</i> Kirby (1.2) ♂ uncommon, ♀ very common	 (0.9) ♂ rare, ♀ not uncommon	 (0.6) ♂ unknown, ♀ rare	—	—
?	 (1.4) none known may occur	—	—	—	—	—

a, b, c) See footnotes on p. 50 and 51.

ALAR POLYMORPHISM IN *CHROTOGONUS*, SHOWING

Valid Species and/or Subspecies	Group	EUPTEROUS			
	Technical Designation	f. macropterus			f. meso- pterus
	E/F Ratios b)	1.75 or more (hyper- macropt.)	Between 1.5 & 1.75 (holo- macropt.)	1.5 or less (hypo- macropt.)	Usually just over 1.5 (mesopt.)
	Remarks				
<i>trachypterus</i> <i>trachypterus</i> (Blanch.)	Rehn (1953) designated a ♀ lectotype [E/F = 1.4] for <i>Ommexecha</i> <i>gracile</i> Blanch.; thus, strictly, the infra-subspe- cific name <i>gracilis</i> is not now applicable to f. <i>ma-</i> <i>cropterus</i> although it was so prior to Rehn's action.	 (2.0) ♂ & ♀ not rare	<i>gracilis</i> (Blanch.) partim (E/F = ?; hind legs lacking) ♂ & ♀ fairly common	 (1.4) ♂ common, ♀ unknown	<i>pallidus</i> (Blanch.) (E/F = ?; too distort- ed) <i>brevus</i> Bol. (1.6) ♂ usual form, ♀ common
<i>trachypterus</i> <i>robertsi</i> Kirby		 (1.8) ♂ known, ♀ may occur	 (1.7) ♂ & ♀ not rare	 (1.4) ♂ common, ♀ unknown	<i>robertsi</i> Kirby (1.6) ♂ & ♀ common
<i>turanicus</i> Kuthy		 (1.8) ♂ known, ♀ may occur	<i>turanicus</i> Kuthy (1.7) ♂ & ♀ not uncommon	 (1.4) ♀ & ♂ common	 (1.5—) ♂ uncommon, ♀ common
<i>(Obbiacris)</i> <i>arenicola</i> Kevan	Few specimens known	—	—	 (1.2)	<i>arenicola</i> Kevan (1.0)
<i>(Obbiacris)</i> nov. sp. (Somalilands etc.)	Not much material avail- able.	—	—	 (1.5 —)	—

RELATIONSHIPS BETWEEN NAMED FORMS a)

HYOPTEROUS

f. brachypterus c)				f. micropterus		
Over 1.5 (mega- brachypt.)	1.25—1.5 (sub- brachypt.)	Between 1.0 and 1.25 (eu- brachypt.)	0.75—1.0 (hemi- brachypt.)	Between 0.5 and 0.75 (sub- micropt.)	0.25—0.5 (squamipt.)	Under 0.25 (eumicropt.)
—	<i>trachypterus</i> (Blanch.) (1.4) <i>gracilis</i> (Blanch.) partim (1.4) ♂ very com- mon, ♀ usual form	<i>incertus</i> Bol. (1.2) <i>sordidus</i> Kirby (1.2) ♂ rare, ♀ common	—	—	—	—
—	—	—	—	—	—	—
—	—	—	—	—	—	—
—	—	—	—	—	—	—
—	 (1.3)	 (1.1)	—	—	—	—

